PROC. BIOL. SOC. WASH.
94(2), 1981, pp. 535–560

# A REVISION OF THE NETTASTOMATID EEL GENERA *NETTASTOMA* AND *NETTENCHELYS* (PISCES: ANGUILLIFORMES), WITH DESCRIPTIONS OF SIX NEW SPECIES

David G. Smith, James E. Böhlke, and P. H. J. Castle

*Abstract.*—The genera *Nettastoma* Rafinesque and *Nettenchelys* Alcock form an easily recognized group within the family Nettastomatidae. The posterior nostril is displaced dorsally to the top of the head or behind it. The body is deepest in the middle and tapers at both ends. *Nettastoma* has a longer snout and 11–14 pores along the upper jaw; *Nettenchelys* has a shorter snout and 8–10 pores along the upper jaw. The position of the posterior nostril varies greatly among species of the two genera. The larva in both genera is deep-bodied anteriorly and tapers sharply toward the tail. *Nettastoma* contains four species. *Nettastoma melanura* Rafinesque (Atlantic), *N. syntresis* n. sp. Smith and Böhlke (Atlantic), and *N. solitarium* n. sp. Castle and Smith (Indo-Pacific) have the posterior nostril above the anterior edge of the eye. They are distinguished *inter alia* by the number of supraorbital and lateral-line pores and the relative size of the median vomerine teeth. *Nettastoma parviceps* Günther has the posterior nostril over the posterior edge of the eye. *Metopomycter denticulatus* Gilbert is synonymized with *Nettastoma parviceps,* and the genus *Metopomycter* is synonymized with *Nettastoma. Nettenchelys* contains five species. *Nettenchelys pygmaeus* n. sp. Smith and Böhlke (Atlantic) and *N. gephyra* n. sp. Castle and Smith (Indo-Pacific) have an enlarged median series of anterior vomerine teeth, and the posterior nostril is slightly behind the posterior edge of the eye; *N. pygmaeus* is mature at 150–200 mm TL, *N. gephyra* at about 400 mm. *Nettenchelys inion* n. sp. Smith and Böhlke, (Atlantic), *N. exorius* n. sp. Böhlke and Smith (Atlantic), and *N. taylori* Alcock (Indo-Pacific) lack the enlarged anterior vomerine teeth and have the posterior nostril at or behind the occiput. In *N. inion* the posterior nostril is just in front of the supratemporal canal, in *N. exorius* slightly behind the occiput, and in *N. taylori* between the dorsal-fin origin and the anus.

The Nettastomatidae are a rather poorly known family of eels inhabiting the outer continental shelf and the continental slope of the world's tropical and warm temperate oceans. Closely related to the Congridae, nettastomatids are characterized primarily by an elongation and narrowing of the head and snout and an enlargement of the mouth. The teeth are generally small and in multiserial bands. The body is elongate and the tip of the tail is greatly attenuated. Pectoral fins are usually absent. The distinction between the Congridae and the Nettastomatidae is not clear, and further study may lead to the union of the two families.

One readily distinguishable group within the Nettastomatidae is composed of the nominal genera *Nettastoma* Rafinesque, *Metopomycter* Gilbert, and *Nettenchelys* Alcock. In this group the posterior nostril is displaced dorsally to the top of the head or even farther back in some species. The body is deepest in the middle and tapers toward both ends. The larva in these forms is deep bodied anteriorly and narrows sharply toward the tail (Smith 1979:11).

This group was known for many years from a single Atlantic species of *Nettastoma, N. melanura* Rafinesque, and two poorly defined Pacific species of *Metopomycter, M. parviceps* (Günther) and *M. denticulatus* Gilbert. These two genera were distinguished by the position of the posterior nostril, near the anterior margin of the eye in *Nettastoma* and near the posterior margin of the eye in *Metopomycter*. *Nettenchelys* was so poorly known that no attempt had been made to determine its relationships; its omission from Jordan's Genera of Fishes (Jordan 1917–1920) may have contributed to its obscurity.

We have recently discovered several additional species of this group in both the Atlantic and Indo-Pacific. The holotype and only known specimen of *Nettenchelys taylori* Alcock was reexamined and determined to belong to the group. The position of the posterior nostril is now seen to form a graded series among the species, and the basic distinction between *Nettastoma and Metopomycter* has largely disappeared. However, a character that does divide these species clearly into two groups is the length of the snout and the number of pores along the upper jaw. *Nettastoma melanura, N. syntresis* n. sp., *N. solitarium* n. sp. and *N. parviceps* have 11 to 14 pores in this series and a correspondingly longer snout. The remaining species have a shorter snout and eight to ten pores. We recognize these two groups as genera, *Nettastoma* and *Nettenchelys*. *Metopomycter* becomes a synonym of *Nettastoma*.

## Methods

Head length is measured to the upper corner of the gill opening. The upper jaw is measured from the tip of the snout to the posterior end of the maxilla. Interbranchial distance is measured between the lower end of the gill openings across the ventral midline. Depth is measured at the anus. Head pores are designated as in Smith and Kanazawa (1977) except that there is no postrictal pore in the infraorbital canal; infraorbital pores are

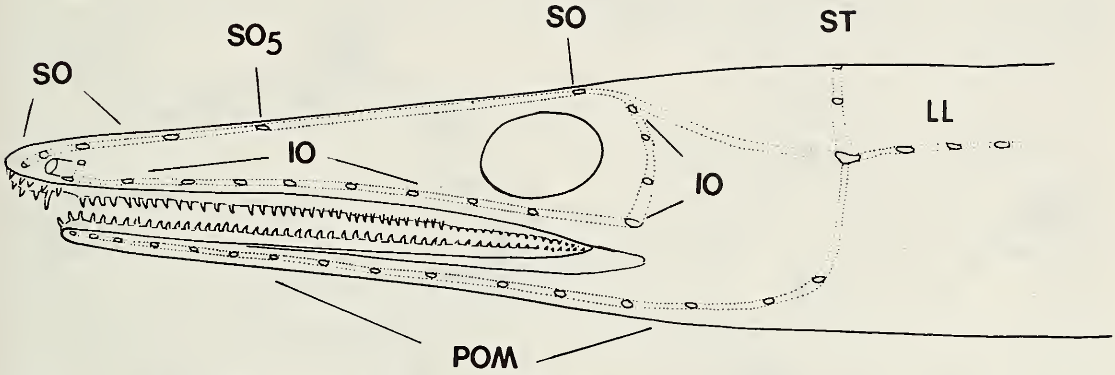

Fig. 1. Diagrammatic view of head of a nettastomatid to show sensory canals and pores. Abbreviations explained in text.

given as those along the upper jaw plus those behind the eye. The presence or absence of the fifth supraorbital pore ($SO_5$) is diagnostic in the species of *Nettastoma,* and its position is indicated in Fig. 1. The anteriormost lateral-line pore is located at the junction of the lateral-line and the supratemporal and preoperculomandibular canals. We call this a lateral-line pore throughout, although in the holotype of *Nettenchelys taylori* it is located below the level of the lateral-line canal. Lateral-line pores counted are those anterior to the anus. In the descriptions, the number of specimens that each count or measurement was based upon is given in parentheses following that value. Unless otherwise stated, lengths are total lengths (TL).

Abbreviations for pores are as follows: LL = lateral-line, POM = preoperculomandibular, IO = infraorbital, SO = supraorbital, ST = supratemporal.

Abbreviations for museums are as follows: AM, Australian Museum, Sydney; ANSP, Academy of Natural Sciences of Philadelphia; BMNH, British Museum (Natural History), London; BPBM, Bernice P. Bishop Museum, Honolulu; MB, Museu Bocage, Lisbon; MNHN, Muséum National d'Histoire Naturelle, Paris; RUSI, Rhodes University, Grahamstown, South Africa; SAM, South African Museum, Capetown; TM, Tasmanian Museum, Hobart; UMML, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Florida; USAIC, Ichthyological Collection, University of South Alabama, Mobile; USNM, National Museum of Natural History, Washington, D.C.; ZMUC, Zoological Museum, University of Copenhagen; ZSI, Zoological Survey of India, Calcutta.

## Genus *Nettastoma* Rafinesque, 1810

*Nettastoma* Rafinesque, 1810:66 (type-species *Nettastoma melanura* Rafinesque, 1810, by monotypy).

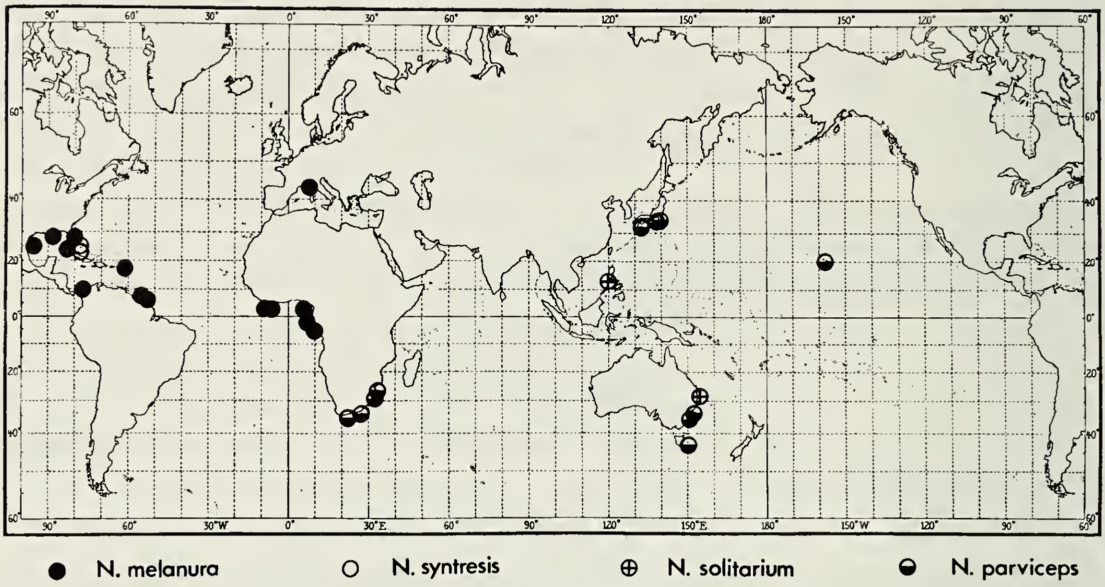

Fig. 2. Distribution of the species of *Nettastoma.*

*Hyoprorus* Kölliker, 1854:101 (type-species *Hyoprorus messinensis* Kölliker, 1854, by monotypy).

*Metopomycter* Gilbert, 1905:585 (type-species *Metopomycter denticulatus* Gilbert, 1905, by original designation).

*Muraenosaurus* Osorio, 1909:14 (type-species *Muraenosaurus Güntheri* Osorio, 1909, by monotypy). Preoccupied by *Muraenosaurus* Seeley, 1874, Reptilia.

*Osorina* Whitley, 1951:68 (type-species *Muraenosaurus Güntheri* Osorio, 1909, by original designation). To replace *Muraenosaurus* Osorio.

*Description.*—Body elongate, round in cross section, deepest in middle and tapering at both ends. Tail slender and attenuate, tip delicate and easily damaged. Pectoral fin absent. Dorsal fin originates above gill opening. Head elongate, slightly depressed, snout length about 35–49% head length; anterior nostrils tubular, opening laterally just behind tip of snout; posterior nostrils displaced dorsally near anterodorsal or posterodorsal margin of eye; tip of snout soft, flexible, extending a short distance in front of the premaxillary teeth. Teeth relatively small, in multiserial bands or patches. Maxillary and mandibular teeth in bands, innermost teeth somewhat enlarged; premaxillary tooth patch short, continuous with maxillary teeth; vomerine tooth patch elongate, reaching level of eye, median teeth sometimes enlarged. Eleven to fourteen infraorbital pores along upper jaw, the second one slightly elevated in short ascending branch of infraorbital canal immediately behind anterior nostril (Fig. 1); five or six supraorbital pores including one near posterior end of canal above eye; third supraorbital pore slight-

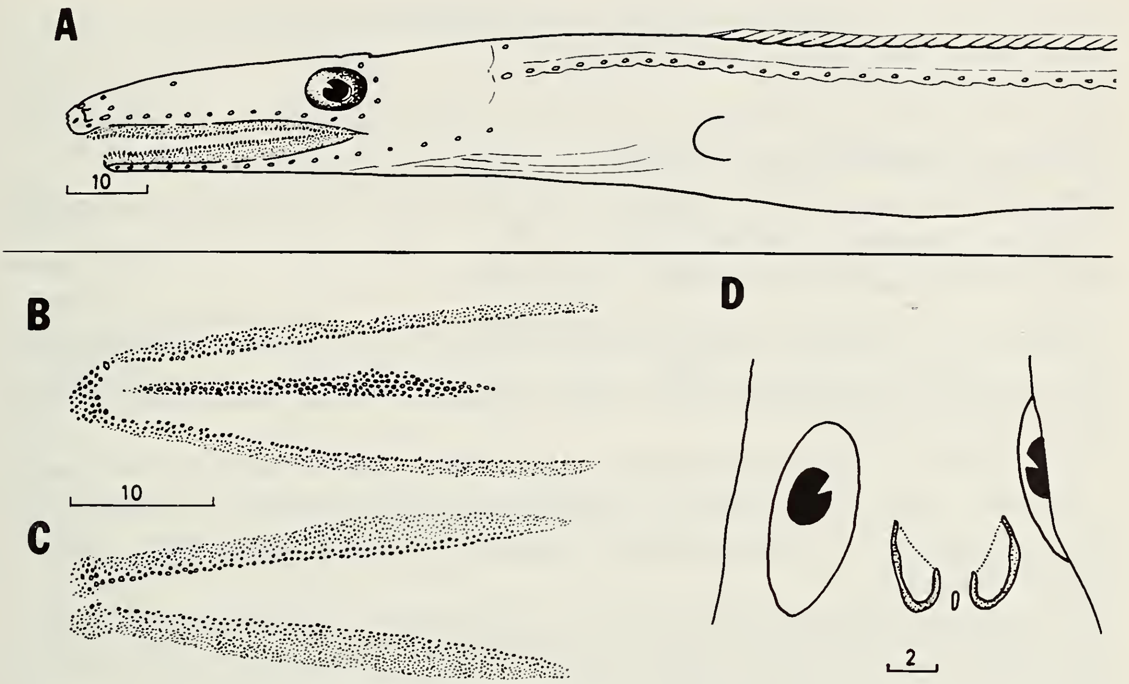

Fig. 3. *Nettastoma parviceps,* AM I.20452-003 (634 mm incomplete). A, Head. B, Upper dentition. C, Lower dentition. D, Dorsal view of a portion of head to show posterior nostrils and posteriormost supraorbital pore. Scales in mm; a single scale applies to B and C.

ly posterior to second infraorbital pore (i.e., the one in ascending branch of infraorbital canal); three supratemporal pores. Viscera: stomach pale, reaching near level of vent; intestine pale. Maximum TL probably 800–1000 mm.

*Range.*—Eastern and western tropical Atlantic, including Mediterranean; Indo-Pacific from East Africa to Hawaii, Australia to Japan (Fig. 2).

*Etymology.*—Gr. *netta,* duck; Gr. *stoma,* mouth. The gender is neuter.

*Note.*—*Nettastoma elongatum* Kotthaus, 1968 is a species of *Saurenchelys* Peters.

## Key to the Species of *Nettastoma*

1. Posterior nostril near posterior margin of eye (Indo-Pacific) ........ *N. parviceps* Günther
– Posterior nostril near anterior margin of eye .................... 2
2. $SO_5$ pore usually absent; median vomerine teeth slightly enlarged; LL pores 44–49 (Atlantic) .................. *N. melanura* Rafinesque
– $SO_5$ pore usually present; LL pores 45 or fewer ................. 3
3. LL pores 38–41; median vomerine teeth not enlarged (western Atlantic) .................................. *N. syntresis* n. sp.
– LL pores 43–45; median vomerine teeth somewhat enlarged (Indo-Pacific) .................................. *N. solitarium* n. sp.

### *Nettastoma parviceps* Günther, 1877
Figs. 2, 3

*Nettastoma parviceps* Günther, 1877:446 (original description, Yedo, Japan, holotype BMNH 1879.5.14.440).
*Metopomycter denticulatus* Gilbert, 1905:585, fig. 233 (original description, Hawaii, holotype USNM 52191).
*Metopomycter parviceps*: Gilbert, 1905:585.

*Diagnosis.*—$SO_5$ pore normally absent (Fig. 3A). LL pores 49–58. Median vomerine teeth not enlarged (Fig. 3B). Posterior nostril above posterodorsal corner of eye (Fig. 3D).

This species has appreciably more lateral-line pores than *N. melanura, N. syntresis,* and *N. solitarium,* and differs from these species in having the posterior nostril over the posterior margin of the eye rather than over its anterior corner.

*Description.*—Meristic characters: Total vertebrae unknown but at least 230. Pores: LL 49–58 (33); POM 15–20 (23), IO 11–14 (24) + 3 (29); SO 5–6 (24); ST 3 (23; one specimen had 4).

Morphometric characters: Predorsal length 25–32% preanal length (37); head 27–34% preanal (37); snout 36–49% head (36); eye 9–14% head (37); upper jaw 50–66% head (36); gill opening 3–9% head (37); interbranchial 7—17% head (35); depth 4–10% preanal (32).

Dentition (Fig. 3B, C): Maxillary and mandibular teeth in bands, the inner teeth slightly larger; premaxillary tooth patch short, continuous with maxillary teeth; vomerine tooth patch elongate, reaching level of eye, median teeth not enlarged.

Color: A freshly caught specimen (AM I.20452-003) was gray; vertical fins black-edged; snout gray-black; iris and opercular regions silver.

Size: The largest specimen examined was 815 mm TL, 335 mm preanal. Females with large eggs were about 500–600 mm TL.

*Variation.*—*Nettastoma parviceps* is known from four widely separated areas: Japan, Hawaii, Australia, and South Africa. These four populations differ from each other in four characters (Table 1). In addition, the two northern hemisphere populations differ from the two southern hemisphere populations in the nature of the posteriormost supraorbital pore (the one between the posterior nostrils). In the former this pore is paired, whereas in the latter the pores of the right and left sides are fused into a single median pore (Fig. 3D).

Specimens of *N. parviceps* almost invariably have damaged tails, making it impossible to give accurate vertebral counts. Several specimens in which the caudal region seemed to be intact or nearly so yielded counts of about 230. The holotype of *N. parviceps* (from Japan) has approximately 234 vertebrae with 53 preanal; that of *Metopomycter denticulatus* (from Hawaii)

Table 1.—Geographic variation in *Nettastoma parviceps*.

| Predorsal length as percentage of preanal length | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |
|---|---|---|---|---|---|---|---|---|
| Japan | 1 | 0 | 2 | 3 | 1 | | | |
| Hawaii | | | | 3 | 5 | 3 | 4 | |
| South Africa | | 2 | 3 | 3 | 1 | 1 | 2 | 1 |
| Australia | 1 | 2 | | | | | | |

| Head length as percentage of preanal length | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
|---|---|---|---|---|---|---|---|---|
| Japan | | 2 | 2 | 3 | | | | |
| Hawaii | | | | | 1 | 3 | 5 | 6 |
| South Africa | | | 2 | 2 | 4 | 4 | 1 | |
| Australia | 1 | 1 | 0 | 1 | | | | |

| Snout length as percentage of head length | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | . . . | 49 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Japan | | | | | 3 | 1 | 3 | | | | |
| Hawaii | | 1 | 3 | 6 | 3 | 1 | 1 | | | | |
| South Africa | 2 | 0 | 1 | 3 | 3 | 1 | 1 | 0 | 1 | . . . | 1 |
| Australia | | | | 1 | 1 | 0 | 0 | 0 | 1 | | |

| Preanal lateral-line pores | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 |
|---|---|---|---|---|---|---|---|---|---|---|
| Japan | | | | | | 1 | 5 | 0 | 1 | |
| Hawaii | 2 | 4 | 2 | 4 | 2 | | | | | |
| South Africa | | | | | 3 | 1 | 4 | 1 | 0 | 2 |
| Australia | | | | | 1 | 2 | | | | |

has 158 with 50 preanal, but the caudal region is obviously incomplete. Myomere counts from nine larvae (all southern hemisphere) ranged from ca. 220 to 236.

*Range.*—This species (Fig. 2) has been recorded from Japan, Hawaii, eastern Australia from New South Wales to Tasmania, and southeastern Africa from southern Mozambique to near the Cape of Good Hope. Depth 60–1,190 m (mean 575 m). It has a bitemperate distribution, being rare or absent in equatorial waters.

*Study material.*—JAPAN: BMNH 1879.5.14.440 (holotype of *Nettastoma parviceps*: 665), CHALLENGER 232, 35°11′N, 139°28′E, 630 m, 12 May 1875. USNM 112037 (1:546), ALBATROSS D5059, 33°05′30″N, 138°39′50″E, 13 Oct. 1906. USNM 148872 (1:458) and USNM 149779 (1:518), ALBATROSS D4957, 32°36′N, 132°23′E, 799 m, 23 Aug. 1906. USNM 149786 (1:495), ALBATROSS D4971, 33°23′30″N, 135°34′E, 1,187 m, 30 Aug. 1906. USNM 149787 (2:495–537), ALBATROSS D4972, 35°25′45″N, 135°33′E, 805

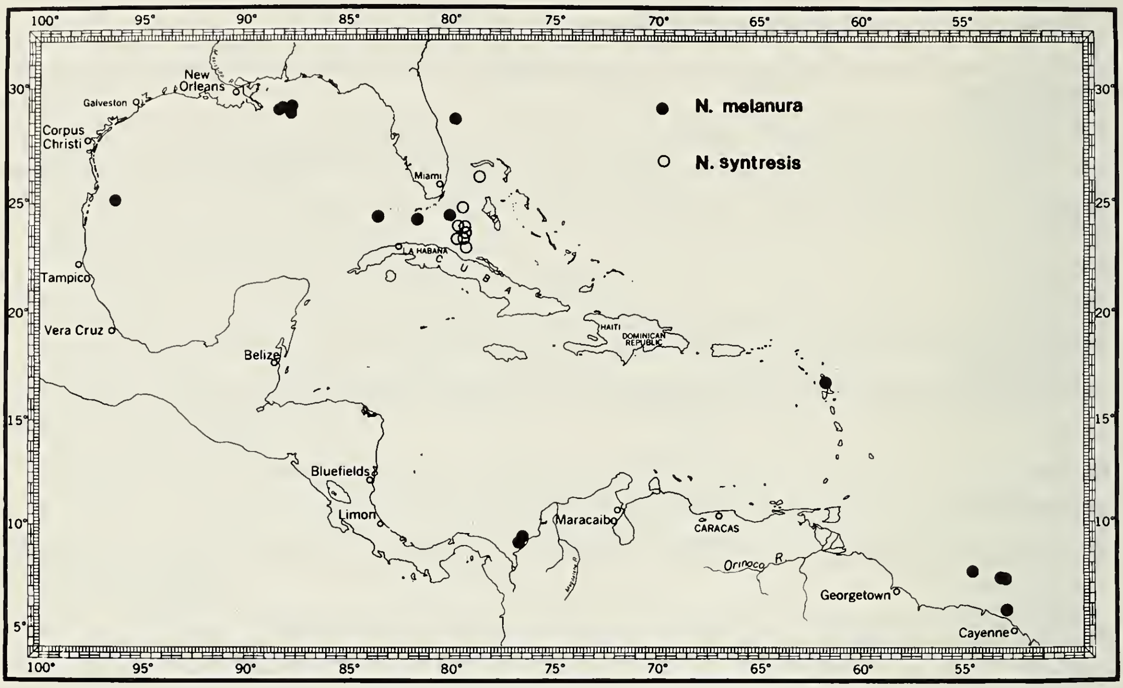

Fig. 4. Distribution of *Nettastoma melanura* and *N. syntresis* in the western North Atlantic.

m, 30 Aug. 1906. USNM 164157 (1:590), ALBATROSS 5067, 35°05′50″N, 138°41′15″E, 15 Oct. 1906.

HAWAII: BPBM 24856 (12:487–755), TOWNSEND CROMWELL 61–66, 21°01′N, 156°08′W, 860 m, 26 Oct. 1972. BPBM 25073 (1:487), TOWNSEND CROMWELL 52–87, Hawaiian Islands, Pailolo Channel, mid-channel, 650 m, 10 March 1971. BPBM 25081 (1:602), TOWNSEND CROMWELL 59–20, 21°09′N, 156°11′W, 100–800 m, 11 July 1972. USNM 52191 (holotype of *Metopomycter denticulatus*: male, 765), Hawaii, 1899.

EASTERN AUSTRALIA: AM I.19376-002 (1:200 incomplete), KAPALA, 35°44′S, 150°38′E, 550 m, 10 Nov. 1976. AM I.20452-003 (2:575–634 incomplete), KAPALA 75-05-05, 33°32′S, 152°00′E, 823 m, 19 Aug. 1975. AM I.20452-004 (1:370 incomplete), KAPALA, 33°31′S, 152°00′E, 822 m, 19 Aug. 1975. TM D1649 (1:480), 43°57′S, 150°23′E, 730–940 m, 30 Dec. 1979.

SOUTHEASTERN AFRICA: ANSP 123528 (1:231), 25°29′S, 33°35′E, 450 m, 28 Sept. 1964. RUSI uncatalogued (1:915), off Limpopo River, Mozambique, 485 m, 17 Jan. 1968. SAM-12785 (1), PIETER FAURE, off Cape St. Blaize, South Africa, 60 m. SAM-12786 (1:256), PIETER FAURE, off East London, South Africa, 357 m. SAM-12787 (3:137–297), PIETER FAURE, off East London, South Africa, 732 m. SAM-12788 (1:259), PIETER FAURE, off East London, South Africa, 549 m. SAM-24372 (2:349 and incomplete), Division of Sea Fisheries, off Durban, South Africa, 406 m 26 July 1964.

*Etymology.*—L. *parvus,* little, and L. *caput,* head; the significance is not obvious, although the head of this species is slightly smaller than that of *N. melanura,* the only other species of the genus known to Günther.

### *Nettastoma melanura* Rafinesque, 1810
Figs. 2, 4, 5A, 6A

*Nettastoma melanura* Rafinesque, 1810:66 (original description, Sicily, holotype lost).

*Muraenophis saga* Risso, 1810:370 (original description, Nice, Holotype MNHN B-849).

*Murenophis saga:* Risso 1826:193.

*Muraena saga:* Costa 1844:10.

*Hyoprorus messinensis* Kölliker, 1854:102 (original description, Messina). Larva.

*Leptocephalus longirostris* Kaup, 1856:150 (original description, North Atlantic). Larva.

*Nettastoma melanurum* Günther, 1870:48 (unjustified emendation).

*Nettastoma mendax* Facciolà, 1893:147 (original description, Mediterranean).

*Nettastoma saga:* Facciolà, 1899:31.

*Muraenosaurus Güntheri* Osorio, 1909:14, pl. 1, Fig. 2–4 (original description, Portugal, holotype MB 2066).

*Leptocephalus urosema* Lea, 1913:39 (original description, near Azores, two syntypes at Natural History Museum, Bergen). Larva.

*Osorina guentheri:* Whitley 1951:68.

Not *Nettastoma melanura* Rafinesque of Facciolà 1893:144, 1899:30, Poll 1953:129.

*Diagnosis.*—Usually five supratemporal pores, $SO_5$ absent (Fig. 5A). LL pores 43–49. Median vomerine teeth somewhat enlarged (Fig. 6A). Posterior nostril near anterodorsal margin of eye.

*Description.*—Meristic characters: Total vertebrae ca. 190–210. Branchiostegal rays 9 (1). Pores: LL 43–49 (32); POM 18–21 (27); IO 12–14 (29) + 3 (30); SO 5 (29); 6 (4); ST 3 (28; one specimen had 5).

Morphometric characters: Predorsal 33–40% preanal (31); head 35–42% preanal (31); snout 35–44% head (30); eye 8–11% head (30); upper jaw 51–62% head (29); gill opening 2–8% head (26); interbranchial 13–29% head (17); depth 5–12% head (28).

Dentition (Fig. 6A): Maxillary and mandibular teeth in bands, the inner teeth largest; premaxillary tooth patch short, continuous with maxillary teeth; vomerine tooth patch elongate, reaching level of eye, median teeth usually enlarged somewhat, but not forming a single row.

Osteology: Supraoccipital absent. Upper pharyngeals divided. Epicentral processes on caudal vertebrae.

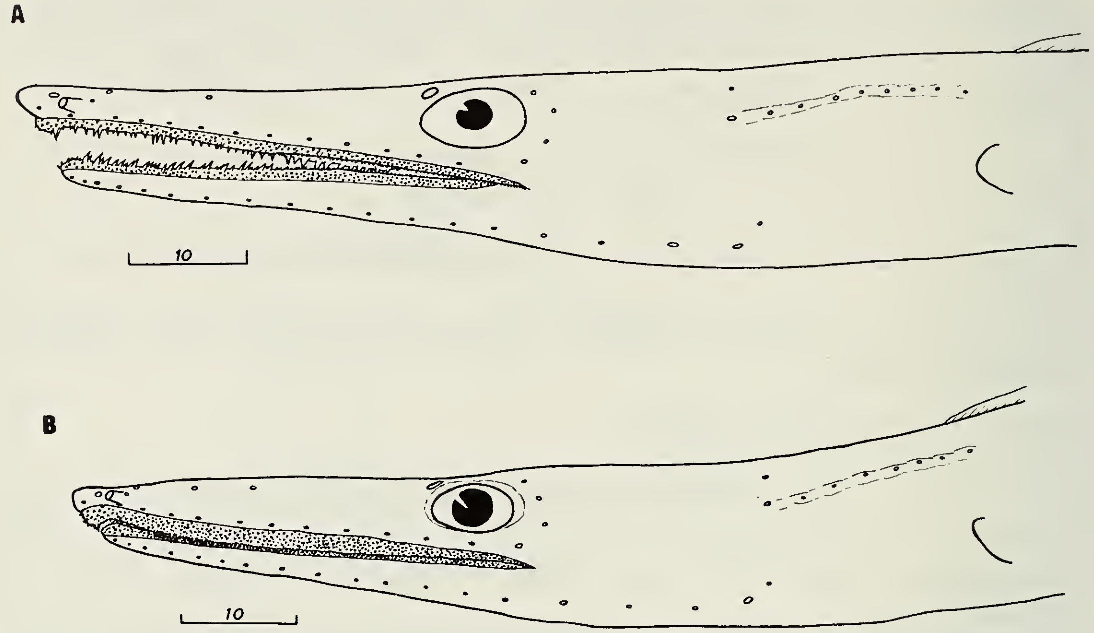

Fig. 5. A, Head of *Nettastoma melanura,* ANSP 117074 (581 mm). Note absence of $SO_5$ pore. B, Head of *Nettastoma syntresis,* ANSP 114965 (433 mm). Note presence of $SO_5$ pore. Scales in mm.

Color: In preservative, brown or gray; vertical fins black-edged.

Size: The largest specimen examined was 773 mm TL, 303 mm preanal.

*Variation.*—The frequency of regenerated tails makes it difficult to obtain complete vertebral counts. The few x-rayed specimens that appeared to be intact yielded counts of slightly over 200. Myomere counts from 15 larvae ranged from 186 to 211.

Of 33 specimens examined, 29 lacked the $SO_5$ pore. Three specimens had this pore on one side but not the other. One specimen had the pore on both sides, but they were not directly opposite each other. The presence of the $SO_5$ pore is an anomalous condition in this species.

Despite its wide range, we find no evidence of geographic variation in *Nettastoma melanura.*

*Nomenclatural note.*—During much of the nineteenth century *Nettastoma melanura* was confused with the other nettastomatid inhabiting the Mediterranean, the species now known as *Facciolella physonema* (Facciolà), which is characterized by the posterior nostril opening through a slit in the upper lip. Facciolà (1893:147) recognized this and concluded that Rafinesque's *Nettastoma melanura* referred to the species with the labial nostril; he proposed *Nettastoma mendax* for the species with the superior nostril. He later (1899) elaborated on this but decided that the species with the superior nostril should be known as *Nettastoma saga* (Risso, 1810). Still later (Facciolà, 1911, 1914) he reversed his opinion and decided that *N. melanura* Rafinesque really referred to the species with the superior nostril.

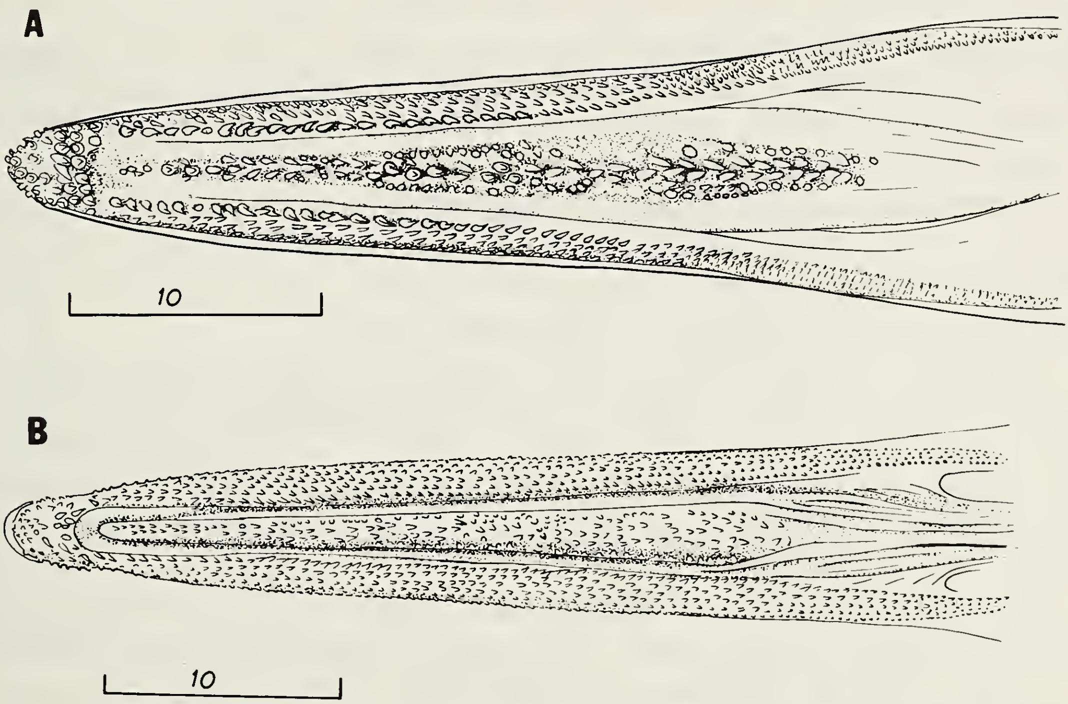

Fig. 6 A, Upper dentition of *Nettastoma melanura*, ANSP 117074 (581 mm), showing enlarged median vomerine teeth. B, Upper dentition of *Nettastoma syntresis*, ANSP 158936 (482 mm). Note median teeth not enlarged. Scales in mm.

This made *N. saga* and *N. mendax* synonyms of *N. melanura* and left the species with the labial nostril without a name. Facciolà (1911:275) gave the generic name *Nettastomella* (preoccupied and later replaced by *Facciolella* Whitley) and later (Facciolà, 1914:47) the specific name *physonema* to the latter. Thus at different times Facciolà used the name *Nettastoma melanura* to refer to two distinct species of eel.

*Range.*—Widely distributed on both sides of the Atlantic, from the Mediterranean to the Gulf of Guinea and from the northern Gulf of Mexico and east coast of Florida through the Caribbean to the Guianas (Figs. 2, 4). Depth 37–1647 m (mean 730 m). *Nettastoma melanura* appears to be absent from the Santaren and Nicholas Channels, and the Bahamas. It is replaced there by *Nettastoma syntresis* n. sp.

*Study material.*—GULF OF MEXICO: ANSP 117066 (2:567–660), OREGON 4815, 25°05′N, 96°27′W, 732 m, 12 Apr. 1964. ANSP 117074 (1:581), OREGON 4076, 28°33′N, 86°27′W, 458 m, 3 Dec. 1962. USNM 178997 (2:616, incomplete), OREGON 4149, 29°12′N, 87°48′W, 732 m, 17 Dec. 1962. USNM 179069 (3:440–773), OREGON 4006, 29°03′N, 88°20′W, 641 m, 23 Oct. 1962. USNM 195898 (2:339–544), OREGON 2822, 28°55′N, 87°49′W, 1647 m, 16 July 1960. USNM 198051 (1:666), OREGON 4580, 29°06′N, 88°06′W, 732 m, 11 Dec. 1963.

STRAITS OF FLORIDA: UMML 13212 (1:606), OREGON 4374, 24°21′N, 83°36′W, 732 m, 7 Aug. 1963. UMML 13727 (1:373), OREGON 4373, 24°26′N, 83°31′W, 549 m, 7 Aug. 1963. UMML 15648 (1:473), GERDA 362, 24°10′N, 81°42′W, 631 m, 15 Sept. 1964. USNM 185651 (1:294), SILVER BAY 449, 28°42′N, 79°48′W, 512–576 m, 11 June 1958. USNM 197341 (1:626), SILVER BAY 3516, 24°24′N, 80°00′W, 732–860 m, 9 Nov. 1961.

CARIBBEAN: ANSP 126445 (1:635), OREGON 11231, 8°56′N, 76°53′W, 622 m, 2 Nov. 1970. USNM 198754 (1:727), OREGON 4902, 9°02.4′N, 76°31.5′W, 732 m, 28 May 1964. USNM 219848 (1:780), OREGON 6703, 16°53′N, 61°53′W, 750–842 m, 21 May 1967.

GUIANAS: ANSP 114844 (1:655), OREGON 10800, 7°20′N, 53°04′W, 692 m, 17 Nov. 1969. USNM 158933 (1:482), OREGON 2039, 5°47′N, 52°55′W, 37 m, 11 Nov. 1957. USNM 158934 (1: incomplete), OREGON 2011, 7°46′N, 54°36′W, 732 m, 7 Nov. 1957. USNM 158935 (1:659), OREGON 2030, 7°10′N, 52°55′W, 549 m, 10 Nov. 1957. USNM 185639 (1:606), OREGON, off Surinam, Sept. 1958.

GULF OF GUINEA: UMML 15145 (4:469–555), PILLSBURY 74, 4°20′N, 9°26′W, 732 m, 4 June 1964. UMML 16940 (1:224), PILLSBURY 51, 4°56′N, 5°01′W, 329–494 m, 31 May 1964. UMML 20903 (3:200–420), PILLSBURY 256, 3°45′N, 8°03′E, 408–485 m, 14 May 1965. USNM 198619 (1:337), GERONIMO 199, 1°26.4′W, 8°24′E, 3 Sept. 1963. USNM 198629 (1:406), GERONIMO 2-247-VIII, 4°38′S, 11°01′E, 9 Sept. 1963. USNM 199537 (1:460), GERONIMO 206, 2°00′S, 8°47′E.

MEDITERRANEAN: USNM 49345 (1:602), Nice, France.

*Etymology*.—Gr. *melan,* black, dark, and Gr. *oura,* tail, referring presumably to the dark edges of the posterior part of the dorsal and anal fins. The correct form of the name would seem to be *melanura* and not the emended form *melanurum,* despite the fact that *Nettastoma* is neuter. The Greek "*oura*" is a feminine noun, and *melanura* could legitimately stand as an appositional noun. There is nothing in the original description to indicate whether Rafinesque intended it as an adjective or a noun. The amended article 30(i) of the International Code of Zoological Nomenclature states clearly that in such cases the name is to be treated as a noun in apposition, hence no justification exists for emending it to *melanurum.*

## *Nettastoma syntresis,* new species, Smith and Böhlke

*Holotype*.—USNM 219849 (male: 442), SILVER BAY 2458, Santaren Channel, 23°40′N, 79°18′W, 531 m, 5 Nov. 1960.

*Diagnosis*.—Normally six supraorbital pores, $SO_5$ present (Fig. 5B). LL pores 38–41. Median vomerine teeth not enlarged (Fig. 6B). Posterior nostril near anterodorsal margin of eye.

*Description*.—Meristic characters: total vertebrae 201 (1). Branchiostegal rays 7/8 on one paratype (USNM 158936). Pores: LL 38–41 (14); POM 18–19 (5); IO 12–13 + 3 (11); SO 5–7 (16); ST 3 (12).

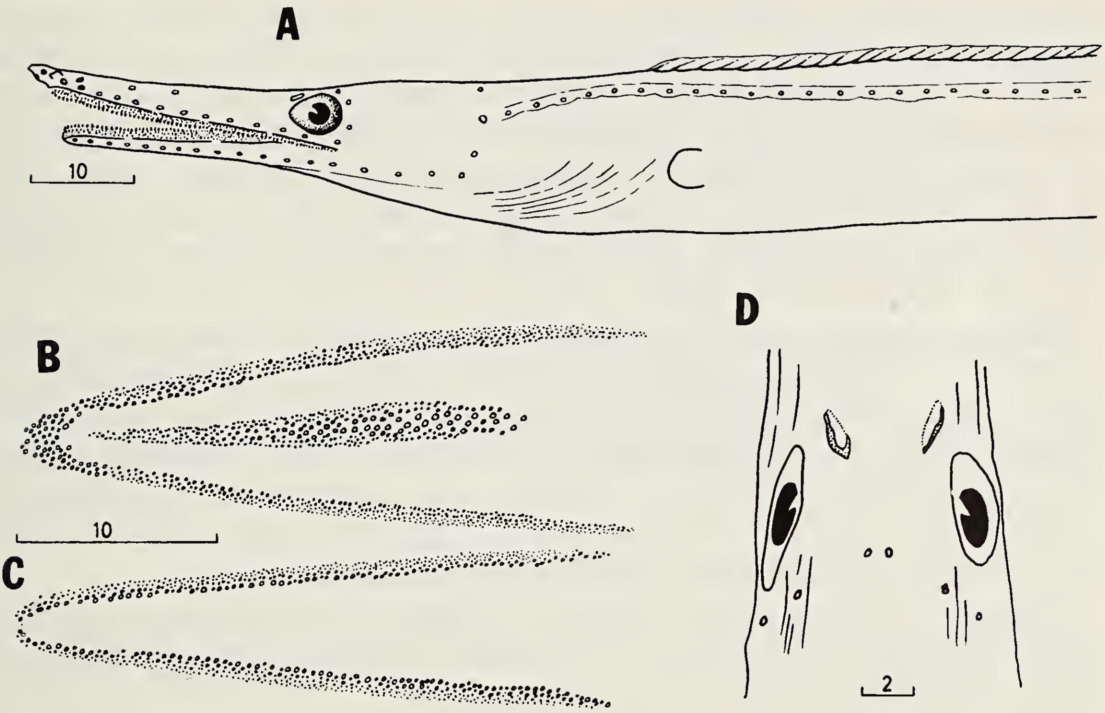

Fig. 7. *Nettastoma solitarium,* holotype (457 mm). A, Head. B, Upper dentition. C, Lower dentition. D, Dorsal view of a portion of head showing posterior nostrils. Scales in mm; a single scale applies to B and C.

Morphometric characters: Preanal 35% TL (1); predorsal 37–41% preanal (13); head 39–43% preanal (13); snout 41–44% head (13); eye 8–11% head (13); upper jaw 57–63% head (12); gill opening 4–7% head (12); interbranchial 10–22% head (9); depth 7–13% preanal (11).

Dentition (Fig. 6B): Maxillary and mandibular teeth in bands, the inner teeth larger; premaxillary tooth patch short, continuous with maxillary teeth; vomerine tooth patch elongate, reaching level of eye, median teeth not enlarged.

Color: In preservative, brown or gray; vertical fins edged in black.

Size: The largest specimen examined was 482 mm TL, 184 mm preanal.

*Variation.*—Of 16 specimens examined, 12 had six supraorbital pores on both sides. One specimen had six on one side and five on the other. Three specimens had six on one side and seven on the other. In no specimen was the $SO_5$ pore absent on both sides.

*Range.*—This species has been collected only in the Santaren Channel (between the Cay Sal Bank and the Great Bahama Bank), the Nicholas Channel (between Cuba and the Cay Sal Bank), and the Northwest Providence Channel, Bahamas. Depth 458–641 m. *Nettastoma syntresis* and *N. melanura* appear to have disjunct distributions (Figs. 2, 4).

*Study material.*—Paratypes: ANSP 114965 (1:433), 23°25′N, 79°40′W, 458 m, 16 Dec. 1969. UMML 31525 (3:320–409), COLUMBUS ISELIN 137, 26°07′N, 78°34.1′W, 560–591 m, 27 Sept. 1973. USNM 157939 (1: incomplete), OREGON 1341, 22°55′N, 79°16′W, 439 m, 16 July 1955. USNM 158936 (1:482), COMBAT 450, 23°59′N, 79°43′W, 641 m, 24 July 1957. USNM 197127 (2:270–360), SILVER BAY 2469, 23°59′N, 79°17′W, 531–549 m, 7 Nov. 1960. USNM 197342 (1: incomplete), SILVER BAY 2475, 24°48′N, 79°17′W, 549 m, 8 Nov. 1960. USNM 197345 (6:251–453), same data as holotype. USNM 202953 (1:260), SILVER BAY 3514, 23°20′N, 79°27′W, 549 m, 8 Nov. 1961.

Others (relatively poor condition, not designated as paratypes): MCZ 38780 (1: ca. 370, in two pieces), ATLANTIS 2982A, 22°48′N, 78°50′W, 384 m, 11 March 1938. MCZ 38781 (1: 122), ATLANTIS 2987A, 23°22′N, 79°56′W, 521 m, 13 March 1938. MCZ 38803 (1: 298), ATLANTIS 2984, 23°16′N, 79°10′W, 439–458 m, 12 March 1938. MCZ 38811 (1: 179), ATLANTIS 3434, 23°10′N, 79°35′W, 476 m, 1 May 1939. MCZ 38814 (1: 250), ATLANTIS 3438, 23°05.5′N, 79°37′W, 485 m, 2 May 1939.

*Etymology.*—Gr. *syntresis,* channel, passage, strait, referring to the Santaren, Nicholas, and Northwest Providence Channels, the only places the species has been found. A noun in apposition.

### *Nettastoma solitarium,* new species, Castle and Smith

Figs. 2, 7

*Holotype.*—MNHN 1979-187 (female: 457), MUSORSTOM Philippines 50, 13°49.2′N, 120°01.8′E to 13°48.2′N, 120°02.5′E, 415–510 m, 25 Mar. 1976.

*Diagnosis.*—Six supraorbital pores, $SO_5$ present (Fig. 7A). LL pores 42–45. Median vomerine teeth somewhat enlarged (Fig. 7B). Posterior nostril above anterodorsal corner of eye.

This species is intermediate between *N. melanura* and *N. syntresis* in the number of lateral-line pores. It shares enlarged vomerine teeth with *N. melanura* and the presence of the $SO_5$ pore with *N. syntresis.*

*Description.*—Meristic characters: Number of vertebrae unknown. Pores: LL 42–45 (3); POM 19 (3); IO 13 + 3 (3); SO 6 (3); ST 3 (3).

Morphometric characters: Predorsal 35–36% preanal (3); head 37–39% preanal (3); snout 40–41% head (3); eye 9–11% head (3); upper jaw 51–54% head (3); gill opening 6–8% head (3); interbranchial 14–16% head (3); depth 9–11% preanal (3).

Dentition (Fig. 7B, C): Maxillary and mandibular teeth in bands, the inner teeth larger; premaxillary tooth patch short, continuous with maxillary teeth; vomerine tooth patch elongate, reaching level of eye, median teeth somewhat enlarged, but not forming a single row.

Color: In preservative, brown or gray; opercular region darker; vertical fins black-edged to wholly black at tip of caudal region.

Size: The largest specimen was 465 mm TL, 179 mm preanal.

*Range.*—This species (Fig. 2) has been collected off the Philippine Islands at 415–610 m and off New South Wales, Australia at 502 m, but we know of it also in the western Indian Ocean (C. Karrer, pers. comm.).

*Study material.*—Paratypes, PHILIPPINES: MNHN 1979-188 (1:465 incomplete), MUSORSTOM Philippines 43, 13°50.5′N, 120°28.0′E to 13°52.3′N, 120°28.6′E, 484–448 m, 24 Mar. 1976. MNHN 1978-189 (1:405 incomplete), MUSORSTOM Philippines 44, 13°46.9′N, 120°29.5′E to 13°46.2′N, 120°29.8′E, 610–592 m, 24 Mar. 1976.

Paratype, AUSTRALIA: AM I.20301-016 (1:320 incomplete), KAPALA, 29°52′S, 153°42′E to 29°55′S, 153°41′E, 502 m, 23 Aug. 1977.

*Etymology.*—L. *solitarius,* solitary, alone, lonely, in reference to the isolated and widely scattered distribution of this species in the Indo-Pacific. An adjective.

## *Nettenchelys* Alcock, 1898

*Nettenchelys* Alcock, 1898:149 (type-species *Nettenchelys taylori* Alcock, 1898, by monotypy).

*Description.*—Body elongate, round in cross-section, deepest in middle and tapering at both ends. Tail slender and attenuate, tip delicate and easily damaged. Pectoral fin absent. Dorsal fin originates above or slightly behind gill opening. Head moderately elongate, slightly depressed; snout length about 33–37% head length; anterior nostrils tubular, opening laterally just behind tip of snout; posterior nostrils located on top of head or body behind posterior margin of eye, degree of posterior displacement varying greatly among the known species (Fig. 8); tip of snout soft, flexible, extending a short distance in front of premaxillary teeth. Maxillary and mandibular teeth in bands, innermost teeth somewhat enlarged; premaxillary tooth patch short, continuous with maxillary teeth; vomerine tooth patch elongate, reaching about to anterior margin of eye, sometimes several enlarged median teeth anteriorly. Eight or nine infraorbital pores along upper jaw including one in short ascending branch of infraorbital canal immediately behind anterior nostril; five supraorbital pores all well anterior to eye; third supraorbital pore slightly anterior to second infraorbital pore; two or three supratemporal pores. Viscera: stomach pale, posterior end near level of vent; intestine pale. Maximum size probably no more than 550 mm TL.

*Discussion.*—The species within the genus *Nettenchelys* as defined here fall into two groups. *Nettenchelys pygmaeus* n. sp. and *N. gephyra* n. sp. have an enlarged median series of teeth at the anterior end of the vomer (Figs. 10B, 11B). The posterior nostrils in these species are located on top of the head behind the posterior edge of the eye (Fig. 8A, B). In *N. taylori* Alcock, *N. exorius* n. sp., and *N. inion* n. sp. the anterior vomerine teeth are not enlarged (Fig. 12B) and the posterior nostrils are located at or behind

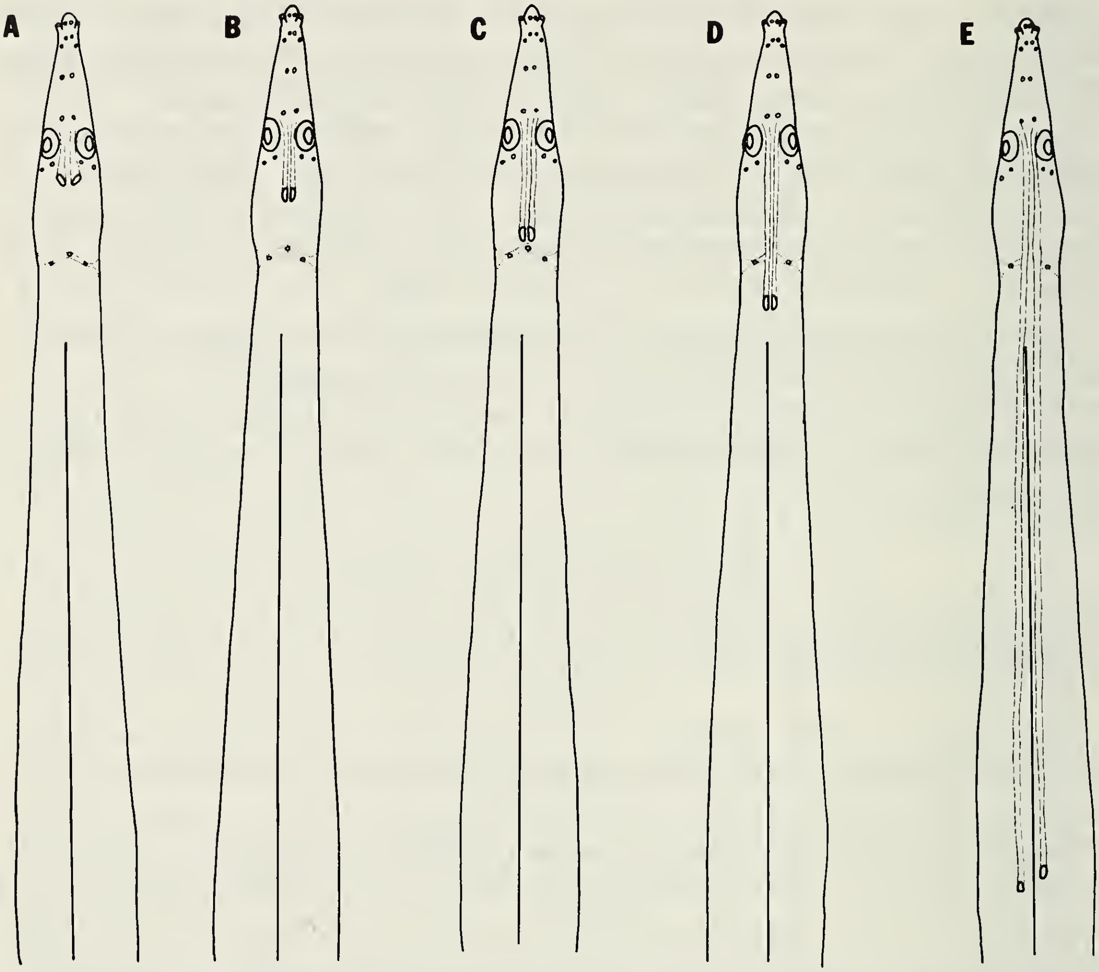

Fig. 8. Semidiagrammatic dorsal view of the five species of *Nettenchelys* showing position of posterior nostrils. A, *N. pygmaeus.* B, *N. gephyra.* C, *N. inion.* D, *N. exorius.* E, *N. taylori.*

the occipital region (Fig. 8C–E). Nevertheless, these two groups are closer to each other than they are to the species of *Nettastoma,* and we feel that this is best expressed by placing them in one genus.

*Range.*—Western North Atlantic and tropical Indo-Pacific. All of the species are known from very few individuals.

*Etymology.*—Gr. *netta,* duck, and Gr. *enchelys,* eel. The Greek *enchelys* can apparently be either masculine or feminine. Alcock did not indicate the gender in his description, and it cannot be inferred from the name of the type species. Article 30(a)(i)(2) of the International Code of Zoological Nomenclature dictates that in such circumstances the name is to be considered masculine.

## Key to the Species of *Nettenchelys*

1. Anterior vomerine teeth forming an enlarged median series; posterior nostrils on top of head slightly behind eye .................. 2

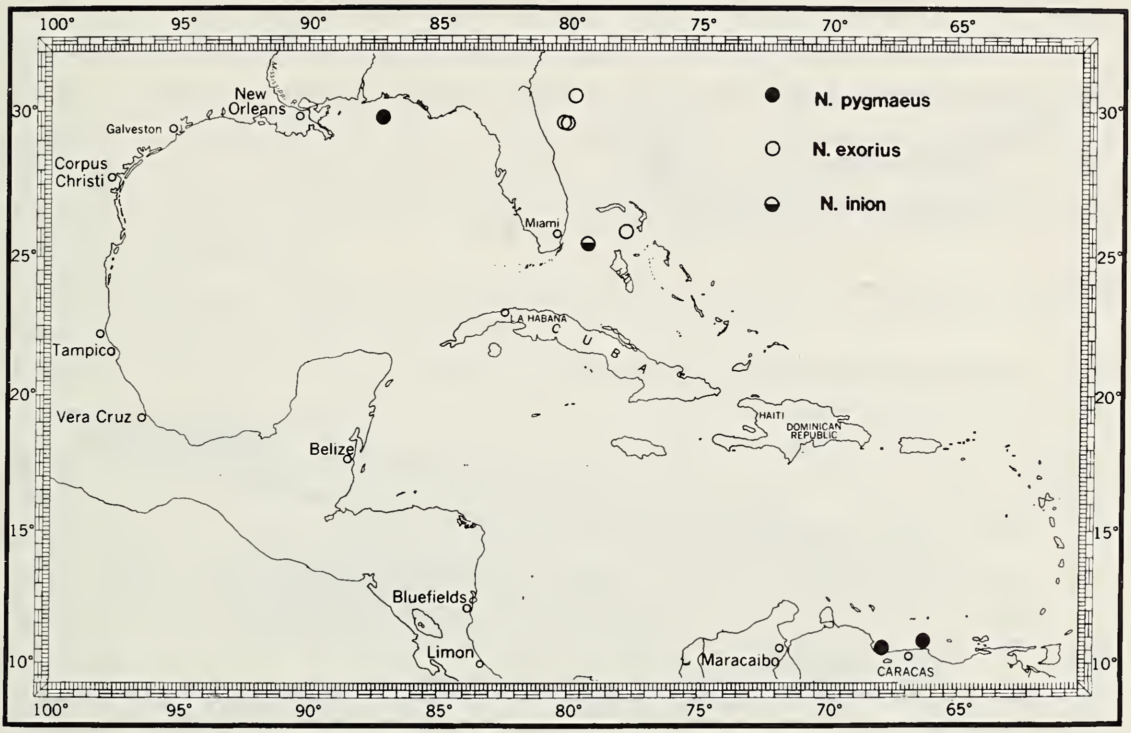

Fig. 9. Distribution of the three species of *Nettenchelys* in the western North Atlantic.

- Anterior vomerine teeth not enlarged, posterior nostrils at or behind occiput ........................ 3

2. Very small, mature at 150–200 mm TL; posterior nostril just behind posterior margin of eye (Western Atlantic) ...... *N. pygmaeus,* n. sp.

- Mature at about 400 mm TL; posterior nostril about midway between posterior margin of eye and occiput (Indo-Pacific) ......... ........................................ *N. gephyra,* n. sp.

3. Posterior nostril just in front of supratemporal canal; median supratemporal pore present (western Atlantic) ............ *N. inion,* n. sp.

- Posterior nostril behind supratemporal canal; median supratemporal pore absent ........................ 4

4. Posterior nostril between occiput and dorsal-fin origin (western Atlantic). ........................ *N. exorius,* n. sp.

- Posterior nostril about midway between dorsal-fin origin and anus (Indo-Pacific) ................................ *N. taylori* Alcock

### *Nettenchelys pygmaeus,* new species, Smith and Böhlke
Figs. 8A, 9, 10

*Holotype.*—ANSP 142277, formerly part of USAIC 03460 (male: 175), Gulf of Mexico, 29°52′N, 87°06.5′W, 128 m, 28 Aug. 1976.

*Diagnosis.*—Anterior median vomerine teeth enlarged (Fig. 10B). Posterior nostril on top of head just behind posterior margin of eye (Fig. 8A). Mature at 150–200 mm TL.

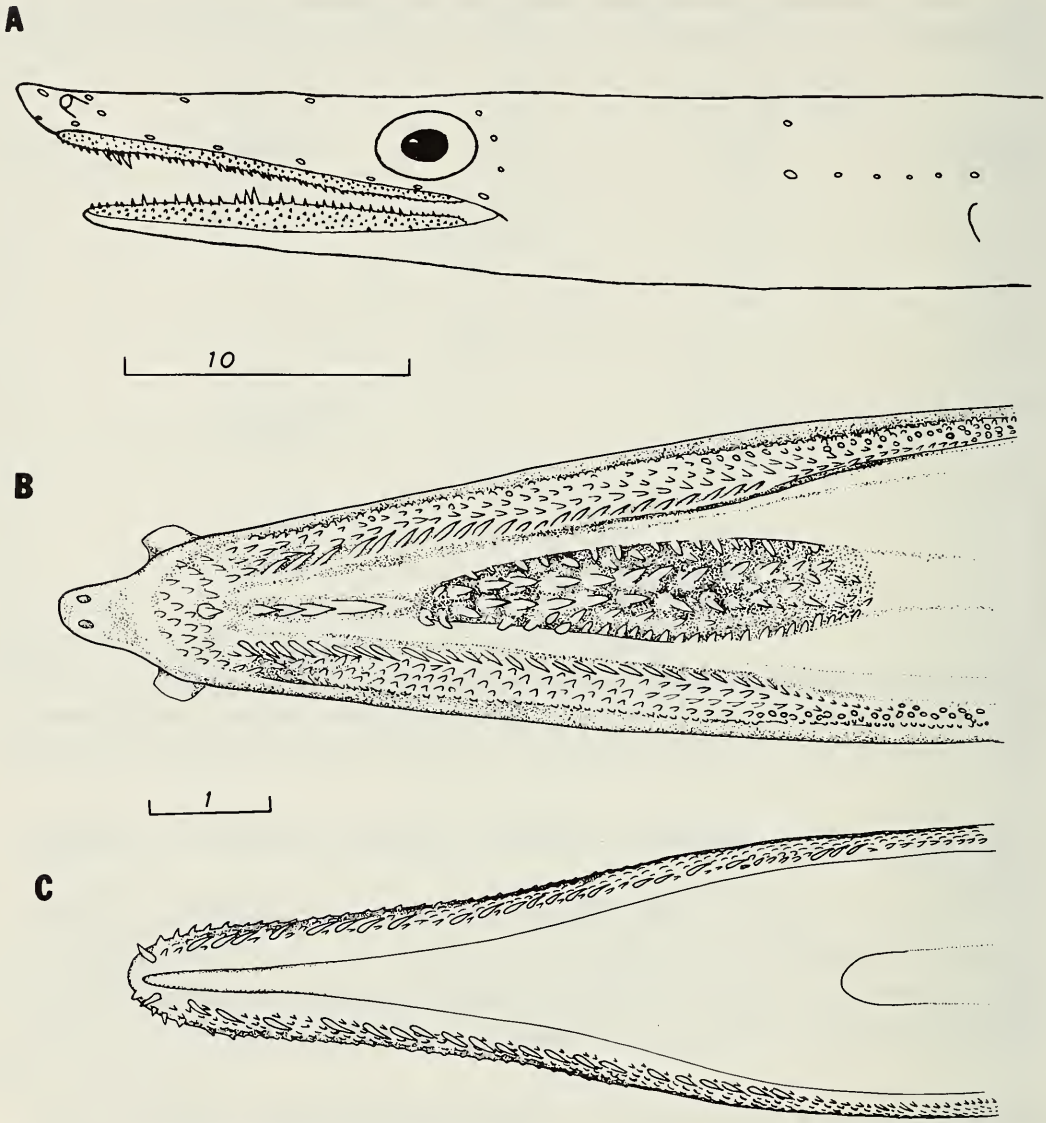

Fig. 10. *Nettenchelys pygmaeus,* ANSP 130812 (167 mm, incomplete). A, Head. B, Upper dentition. C, Lower dentition. Scales in mm; a single scale applies to B and C.

*Description.*—Meristic characters: Pores: LL ca. 40–42 (2); IO 8 + 3 (3); SO 5 (3); ST 3 (3). Number of vertebrae unknown.

Morphometric characters: Preanal ca. 35–36% TL (4); predorsal 33–35% preanal (4); head 30–33% preanal (4); snout 34–37% head (4); eye 8–10% head (4); upper jaw 53% head (2); gill opening 6–7% head (3); depth 7–8% preanal (4).

Dentition (Fig. 10B, C): Maxillary teeth in bands, teeth of innermost series somewhat enlarged. Mandibular teeth in bands, those of innermost series markedly enlarged. Premaxillary tooth patch short, continuous with maxillary teeth. Vomerine tooth patch elongate, reaching about to level of anterior margin of eye, anteriormost part consisting of a single series of enlarged teeth medially.

Color: In preservative brown, darker above than below. One specimen had a distinct bicolored appearance, dark above and pale below.

Size: This is a dwarf species. The largest specimen measured only 201 mm TL, 71 mm preanal. The smallest specimen, a female 151 mm TL, 54 mm preanal was filled with large eggs. Because of the small size, we were unable to obtain satisfactory radiographs or to count the brachiostegal rays and the POM pores.

*Relationships.*—This species is closest to *N. gephyra* of the Indo-Pacific, and the differences are discussed under that species.

*Range.*—Two of the four known specimens came from off western Venezuela, the other two from the northern Gulf of Mexico (Fig. 9). This suggests that the species is probably fairly widely distributed in the western Atlantic. Its small size and relatively deepwater habitat may make it difficult to collect. It would easily slip through the mesh of most nets. Other small eels usually are collected by divers using rotenone, and *Nettenchelys pygmaeus* lives too deep for this. Depth 128–280 m.

*Study material.*—Paratypes, CARIBBEAN: ANSP 130812 (1: 167 incomplete), PILLSBURY 739, 10°54.7′N, 66°17.8′W, 234–280 m, 23 July 1968. USNM 200779 (1: 151), OREGON 5628, 10°42′N, 67°56′W, 210 m, 28 Sept. 1965.

Paratype, GULF OF MEXICO: USAIC 03460 (1:201), same data as holotype.

*Etymology.*—From Gr. *pygmaios*: small, dwarf, referring to the small size of the adults. An adjective.

### *Nettenchelys gephyra*, new species, Castle and Smith

Figs. 8B, 11

*Holotype.*—MNHN 1979-150 (female: 431), Bulari Pass (western reef of New Caledonia), 400 m, 1 April 1978.

*Diagnosis.*—Anterior median vomerine teeth enlarged (Fig. 11B). Posterior nostril on top of head about midway between posterior margin of eye and occiput (Figs. 8B, 11D). Mature at 430 mm TL.

*Description (from holotype).*—Meristic characters: Total vertebrae 158 (incomplete). Brachiostegal rays 5 on right side. Pores: LL 44; POM 17; IO 9 + 3; SO 5; ST 3.

Morphometric characters: Preanal ca. 39% TL; predorsal 31% preanal; head 29% preanal; snout 36% head; eye 12% head; upper jaw 51% head; gill opening 6% head; depth 9% preanal.

Dentition (Fig. 11B, C): Maxillary teeth in bands, those of innermost series distinctly enlarged; mandibular teeth in bands, those of innermost series markedly enlarged; premaxillary tooth patch short, continuous with maxillary teeth; vomerine tooth patch elongate, reaching to level of anterior margin of eye, anteriormost part isolated from remainder and consisting of 3 enlarged teeth in a single row.

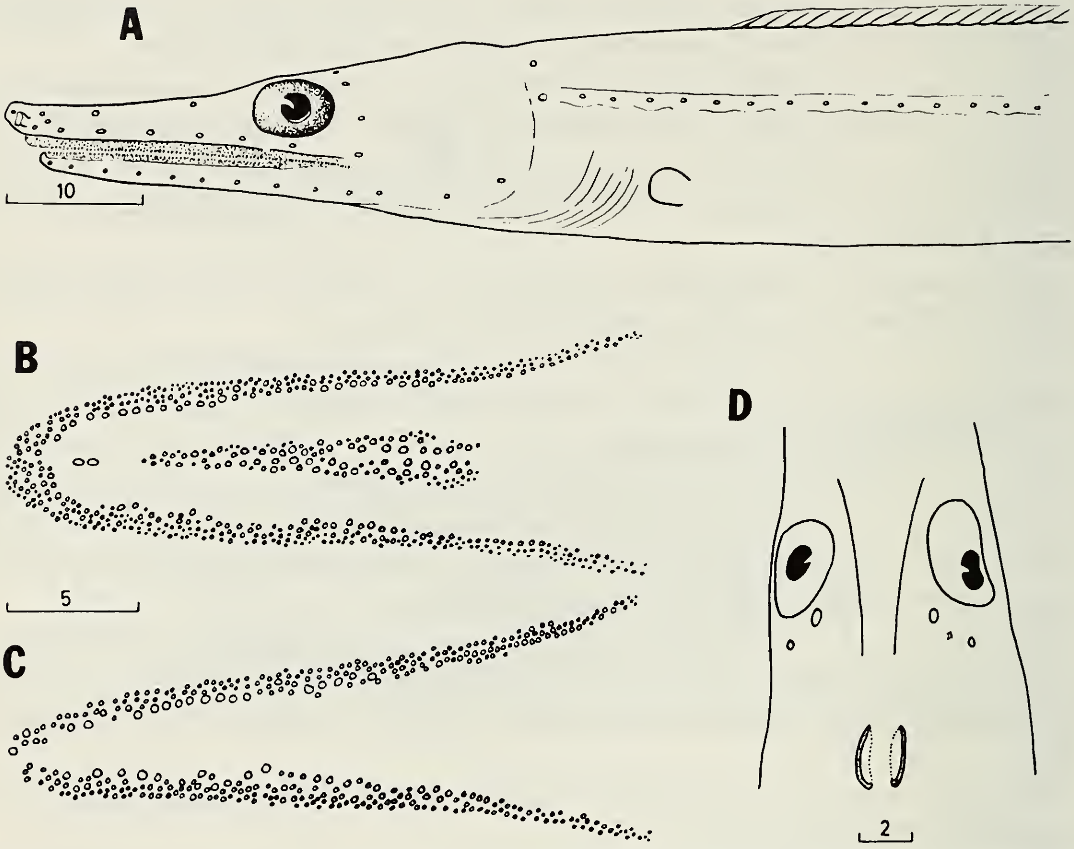

Fig. 11. *Nettenchelys gephyra,* holotype (431 mm). A, Head. B, Upper dentition. C, Lower dentition. D, Dorsal view of a portion of head showing posterior nostrils. Scales in mm; a single scale applies to B and C.

Color: In preservative light brown, darker on head; posterior portions of dorsal and anal fins black.

Size: The holotype, a female of 431 mm TL, 167 mm preanal, had eggs of approx. 0.9 mm diameter. The species probably does not grow much larger.

*Relationships.*—This species most closely resembles the Atlantic *N. pygmaeus.* The principal differences are the size at maturity and the position of the posterior nostril. Whereas the largest *N. pygmaeus* was 201 mm TL, and another specimen of 151 mm also contained large eggs, the holotype of *N. gephyra* measured 431 mm. The posterior nostril is located more posteriorly in the holotype of *N. gephyra* than in *N. pygmaeus. Nettenchelys gephyra* has slightly more preanal lateral-line pores, one more infraorbital pore, and a slightly lesser upper jaw length than *N. pygmaeus,* but these are based on so few specimens that their significance is uncertain.

The second specimen, USNM 134972, is much smaller, but it is badly damaged and neither the sex nor the state of maturity can be determined. Its dentition is identical to that of the holotype, and its posterior nostril is about a third of the way between the posterior margin of the eye and the occiput. We assume it is *N. gephyra,* although because of its poor condition we do not designate it as a paratype.

*Range.*—The two specimens were collected off New Caledonia and the Philippines. Depth about 400 m.

*Study material.*—USNM 134972 (1: 93 incomplete), ALBATROSS D5187, 9°16′45″N, 123°21′15″E, 412 m, 31 March 1908.

*Etymology.*—Gr. *gephyra,* a bridge, in reference to the link that this species provides between *Nettenchelys pygmaeus* and *Nettenchelys inion,* which has the posterior nostrils farther back. A noun in apposition.

### *Nettenchelys inion,* new species, Smith and Böhlke

Figs. 8C, 9

*Holotype.*—ANSP 142274 (male: 423), GERDA 242, 25°36′N, 79°21′W, 458–531 m, 30 Jan. 1964.

*Diagnosis.*—Posterior nostril at occiput, just in front of supratemporal canal (Fig. 8C). Median supratemporal pore present. Anterior vomerine teeth not enlarged. Predorsal 37% preanal, head 38% preanal.

*Description* (from holotype).—Meristic characters: Vertebrae 210 (complete?). Brachiostegal rays 6 on right side. Pores: LL 41; POM 14; IO 9 + 3; SO 5, ST 3.

Morphometric characters: Predorsal 37% preanal; head 38% preanal; snout 37% head; eye 10% head; upper jaw 55% head; depth 10% preanal.

Dentition: Maxillary teeth in bands, innermost teeth somewhat enlarged. Mandibular teeth in bands, inner teeth enlarged. Premaxillary tooth patch short, continuous with maxillary teeth. Vomerine tooth patch elongate, reaching about to eye, anterior teeth not enlarged.

Color: In preservative brown; vertical fins dark-edged posteriorly.

Size: The only known specimen is 423 mm TL, 127 mm preanal.

*Relationships.*—The single known specimen most closely resembles *N. exorius* n. sp. The principal difference is the position of the posterior nostril. In *N. inion* the supratemporal canal is unobstructed, and the median pore is present. The holotype of *N. inion* has slightly greater predorsal, head, and snout lengths than any of the four specimens of *N. exorius.* Since the specimens of *N. exorius* include both males and females, these differences cannot be sexual. There is no evidence elsewhere among the Nettastomatidae that the position of the posterior nostril varies greatly within a species, and we conclude that the specimen described here represents a distinct species.

*Range.*—The single known specimen was collected just south of Bimini at the eastern edge of the Straits of Florida, depth 458–531 m (Fig. 9).

*Etymology.*—Gr. *inion,* back of head, occiput, referring to the position of the posterior nostril. A noun in apposition.

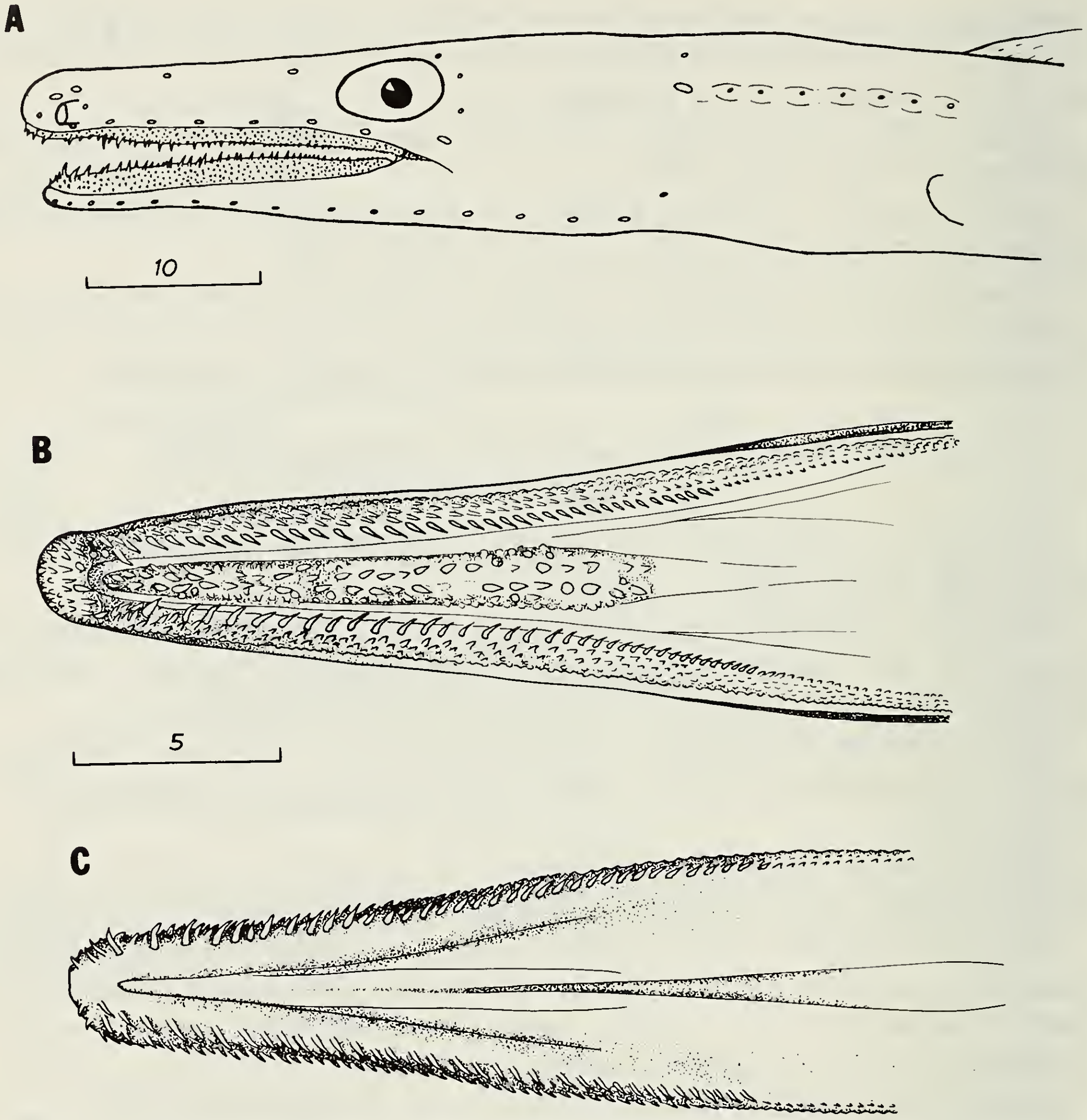

Fig. 12. *Nettenchelys exorius,* ANSP 130813 (429 mm). A, Head. B, Upper dentition. C, Lower dentition. Scales in mm; a single scale applies to B and C.

### *Nettenchelys exorius,* new species, Böhlke and Smith
Figs. 8D, 9, 12

*Holotype.*—ANSP 142275 (female: 467), SILVER BAY 3685, 29°41′N, 80°11′W, 347 m, 22 Jan. 1962.

*Diagnosis.*—Posterior nostril behind occiput, between supratemporal canal and dorsal-fin origin (Fig. 8D). Median supratemporal pore absent, apparently obliterated by nasal tube. Anterior vomerine teeth not enlarged (Fig. 12B). Predorsal 32–34% preanal, head 31–34% preanal.

*Description.*—Meristic characters: Number of vertebrae unknown; all specimens have regenerated tails. Branchiostegal rays 6 on right side in one paratype (ANSP 130813). Pores: LL 40–43 (4); POM 14–16 (3); IO 8–10 + 3 (4); SO 5 (4); ST 2 (4)

Morphometric characters: Predorsal 32–34% preanal (4); head 31–34% preanal (4); snout 34–36% head (4); eye 9–11% head (4); upper jaw 45–51% head (3); gill opening 5–7% head (3); interbranchial 15–19% head (2); depth 8–12% preanal (4).

Dentition (Fig. 12B, C): As in *N. inion.*

Osteology: Supraoccipital absent. Upper pharyngeals divided. First basibranchial ossified, closely articulated with glossohyal. Second basibranchial cartilaginous. Very small epicentral processes on caudal vertebrae.

Color: In preservative, brown; vertical fins dark-edged posteriorly.

Size: The largest specimen was 467 mm TL, 163 mm preanal.

*Range.*—Three of the four known specimens were collected off the northeast coast of Florida. The fourth came from the junction of the Northwest and Northeast Providence Channels in the Bahamas. Depth 277–494 m.

*Study material.*—Paratypes: ANSP 130813 (1: 429), OREGON 5745, 29°40′N, 80°03′W, 458 m, 18 Nov. 1965. ANSP 131739 (1: 329), OREGON 11703, 30°28′N, 79°51′N, 494 m, 19 Jan. 1972.

Other: UMML 20867 (1:253—cleared and stained), GERDA 867, 25°52′N, 77°54′W, 277 m, 20 July 1965.

*Etymology.*—Gr. *exorios,* beyond the frontier, in reference to the posterior nostrils, which have migrated beyond the occiput and are located behind the head. An adjective.

### *Nettenchelys taylori* Alcock, 1898
Fig. 8E

*Nettenchelys taylori* Alcock, 1898:150 (original description, off the Travancore coast, India, holotype listed below); 1899, pl. 25 (Fig. 5).

*Diagnosis.*—Posterior nostril far behind occiput, posterior to midpoint between snout tip and anus (Fig. 8E). Median supratemporal pore absent. Anterior vomerine teeth not enlarged. Predorsal 34% preanal, head 33% preanal.

*Description.*—Meristic characters: Pores: LL 48; POM 15; IO 9 + 3/8 + 3; SO 5; ST 2. Vertebrae: Tail tip regenerated, 48 vertebrae before anal fin.

Morphometric characters: Predorsal 34% preanal; head 33% preanal; snout 33% head; eye 8% head; upper jaw 47% head; gill opening 12% head; interbranchial 15% head; depth at gill opening 8% preanal; depth at anus 10% preanal; snout to posterior nostril 71% of preanal on left side; 68% on right.

Dentition: Maxillary tooth patches irregularly six teeth across at their widest, the teeth of the innermost row moderately enlarged anteriorly but not posteriorly; teeth gradually increasing in size from lateral to medial.

Premaxillary tooth patch irregularly five or six teeth deep (from front to rear) at its broadest, the teeth gradually increasing in size from front to rear; those of posteriormost series enlarged like the anteriormost inner maxillary teeth and, like them, with arrow-shaped tips. Premaxillary and maxillary patches continuous without a space between them.

Vomerine tooth patch twelve rows across at its widest, none of the teeth enlarged, patch terminating posteriorly far short of maxillary and mandibular patches. Teeth largest medially, decreasing in size in both directions laterally. A rather wide separation anteriorly between premaxillary and vomerine patches.

Mandibular tooth patches irregularly about nine teeth across at widest, the teeth increasing in size from outside inward, those of the innermost series moderately enlarged except posteriorly; patches distinctly separated from each other anteriorly. Mandibular patches continue posteriorly to rictus, while maxillary patches extend back beyond that point laterally.

Color: In preservative, brown; vertical fins pale, dusky marginally.

Size: The only known specimen, the holotype, is 533 mm TL. It is a female with eggs.

*Range.*—The only specimen was collected at a depth of 786 m off the Travancore coast, a region in the State of Kerala at the southwestern tip of India.

*Study material.*—Holotype: ZSI F 3171/1 (female: 533 incomplete), INVESTIGATOR Sta. 232, 7°17′30″N, 76°54′30″E, 786 m, 19 Oct. 1897.

*Etymology.*—"Named after Commander A. Dundas Taylor, late Indian Navy, who, in the year 1874 was chiefly instrumental in reviving the Marine Survey of India" (Alcock, 1898:151).

## Acknowledgments

We thank the following for access to specimens or for information on them: E. Bertelsen, Zoological Museum, Copenhagen; A. Crosnier, O.R.S.T.O.M., Paris; P. Fourmanoir, O.R.S.T.O.M., Noumea; J. Paxton, Australian Museum; D. Baron, Tasmanian Fisheries Development Authority; J. E. Randall, Bernice P. Bishop Museum; P. K. Talwar, Zoological Survey of India; C. R. Robins, University of Miami; R. L. Shipp, University of South Alabama; and the curators of the Division of Fishes, U. S. National Museum of Natural History. We thank R. L. Shipp in addition for permitting the holotype of *Nettenchelys pygmaeus* to be deposited at the Academy of Natural Sciences of Philadelphia. Figures 3, 7 and 11 were done by P. H. J. Castle; Figures 6, 10B, 10C, 12B and 12C by Mary H. Fuges; and the remainder by David G. Smith. We thank Eugenia B. Böhlke for X-rays, stained preparations, and assistance with the literature. C. Karrer informed us of the presence of *Nettastoma solitarium* in the western Indian Ocean. We acknowledge National Science Foundation aid in this study: DEB 76-20325 (J.E.B.) and INT 77-12568 (D.G.S.). Robert H. Kanazawa independently recognized as new the species here named *Nettastoma syntresis*; we thank him for relinquishing his material to be included in our revision. This is a contribution from the Marine Biomedical Institute and the Department of Human Biological Chemistry and Genetics, University of Texas Medical Branch at Galveston.

## Literature Cited

Alcock, A. 1898. XXII.—Natural history notes from H. M. Indian Marine Survey Ship 'Investigator,' Commander T. H. Heming, R. N., commanding.—Series II, No. 25. A note on the deep-sea fishes, with descriptions of some new genera and species, including another probably viviparous ophidioid.—Ann. Mag. nat. Hist., (7):136–156.

———. 1899. Illustrations of the zoology of the Royal Indian Marine Survey Ship Investigator, under the command of Commander T. H. Heming, R. N./Fishes.—Part VI, Plates XXV–XXVI. Crustacea.—Part VII, Plates XXXVI–XLV.—Calcutta.

Costa, O. G. 1844. Fauna de Regno di Napoli . . . Pesci, Pt. 1, Fasc. 48–49, Genere Murena; Muraena Thunb. (non Artedi):1–10.

Facciolà, L. 1893. Sull'esistenza di forme di passaggio da alcune specie di leptocefalidi agli adulti corrispondente.—Naturalista Sicil., 12:144–148.

———. 1899. Sull'esistenza di due specie di *Nettastoma* nel Mare di Messina.—Riv. Ital. Sci. Nat., 19(2–3):29–32.

———. 1911. Generi di vertebrati ittioidi del mare di Messina.—Boll. Soc. Zool. Ital., (2)12:268–287.

———. 1914. Su di un nuovo tipo dei Nettastomatidi.—Boll. Soc. Zool. Ital., (3)3:39–47.

Gilbert, C. H. 1905. II. The deep-sea fishes of the Hawaiian Islands. *In*: Jordan, D. S., and B. W. Evermann, The aquatic resources of the Hawaiian Islands.—Bull. U.S. Fish. Commn., 23 (for 1903), Part 2:575–713, pls. 66–101.

Günther, A. 1870. Catalogue of the fishes in the British Museum, 8:xxv + 549 p.

———. 1877. Preliminary notes on new fishes collected in Japan during the expedition of H.M.S. 'Challenger.'—Ann. Mag. nat. Hist., (4)20:433–446.

Jordan, D. S. 1917–1920. The genera of fishes . . . in four parts.—Stanford University, University Series: 576 pp. (+ total of 55 pp. variously paged in Roman numerals). [Part I, 1917, pp. 1–161; Part II, 1919, pp. 163–284; Part III, 1919, pp. 285–410; Part IV, 1920, pp. 411–576].

Kaup, J. J. 1856. Catalogue of apodal fish, in the collection of the British Museum.—London: British Museum, viii + 163 p., 19 pls.

Kölliker, A. 1854. Weitere Bemerkungen über die Helmichthyiden.—Verh. Phys.-med. Ges. Würzb., 4:100–102 (A. Kölliker in this paper although given as Rudolph Albert von Kölliker in Dean's *Bibliography of Fishes*).

Kotthaus, A. 1968. Fische des Indischen Ozeans. Ergebnisse der ichthyologischen untersuchungen . . . "Meteor" . . . A. Systematischer Teil, III, Ostariophysi und Apodes.—Meteor Forsch. (D) 3:14–56.

Lea, E. 1913. Muraenoid larvae from the "Michael Sars" North Atlantic deepsea expedition 1910.—Rep. sci. Res. "Michael Sars" N. Atl. Deep Sea Exped. 1910, 3 (1), Zoology:1–59, 6 pls.

Osorio, B. 1909. Contribuição para o conhecimento da fauna bathypelagica visinha das costas de Portugal/Prefacio.—Mems. Mus. Bocage, 1:1–35, 3 pls.

Poll, M. 1953. Poissons: Téléostéens malacoptérygiens.—Res. sci. Exped. océanogr. belg. eaux côt. afr. Atl. Sud., 4(2)3:258 p., 104 figs., 8 pl.

Rafinesque, C. S. 1810. Caratteri di alcuni nuovi generi e nuove specie di animali e piante della Sicilia, con varie osservazioni sopra i medisimi.—Palermo: 105 p., 20 pls.

Risso, A. 1810. Ichthyologie de Nice, ou histoire naturelle des poissons du département des Alpes maritimes.—Paris, Schoell: xxxvi + 388 p.

———. 1826. Histoire naturelle des principales productions de l'Europe méridionale et particulièrement de celles des environs de Nice et des Alpes maritimes. Vol. 3.—Paris and Strasbourg: xvi + 480 p., 16 pls.

Seeley, H. G. 1874. On *Muraenosaurus Leedsii,* a plesiosaurian from the Oxford clay.—Quart. J. Geol. Soc. Lond., 13(21):197–208, pl. 21.

Smith, D. G. 1979. A guide to the leptocephali (Elopiformes, Anguilliformes, and Notacanthiformes).—NOAA tech. Rep. nat. mar. Fish. Serv. Fish. Circ. 424: iv + 39 pp.

———. and R. H. Kanazawa. 1977. Eight new species and a new genus of congrid eels from the western North Atlantic with redescriptions of *Ariosoma analis, Hildebrandia guppyi* and *Rhechias vicinalis.*—Bull. mar. Sci. 27(3):530–543.

Whitley, G. P. 1951. New fish names and records.—Proc. R. Zool. Soc. N.S.W., 1949–50:61–68.

(DGS) Marine Biomedical Institute, University of Texas Medical Branch, 200 University Blvd., Galveston, Texas 77550; (JEB) Academy of Natural Sciences, 19th and the Parkway, Philadelphia, Pennsylvania 19103; (PHJC) Department of Zoology, Victoria University, Private Bag, Wellington, New Zealand.